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THE STERNALIS MUSCLE.

BY S. W. WILLISTON, M. D.

Of the many interesting muscular anomalies of the human subject, few, if any, have been more enigmatical than the sternalis. At various times, and by various observers, since the days of Albinus, and earlier, it has been regarded as a continuation of the rectus abdominis, perhaps the most prevalent view, and endorsed by Bardeleben; as a part of the sterno-mastoid; as pertaining to the panniculus carnosus group, a view which the eminent anatomist Turner has favored; as a muscle *sui generis,* without homologue in other animals; or as a muscle of the pectoral group, which seems to be the most probable, as well as most recent theory. Neither can we say whether the muscle is vestigial or rudimentary—I use the words in Ryder's sense—though evidence points to the former. But if a vestige, and not a muscle developing, we ought to find a counterpart of it in other animals, which, so far, has not been done, unless indeed, we call it a skin-muscle, which seems very improbable. What then is it, and what are its functions?

From Gruber's[1] and Turner's[2] researches, it appears to occur in the normal human subject, in some form or other, in about three per cent. of all cases. In its normal or typical form, as represented in the case figured herewith, it appears to occur in less than one per cent. of all cases. But, while so abnormal in the normal subject, it appears to be normal in the abnormal subject,—that is, it is almost invariably present in anencephalous monsters. Abraham[3] found it in six out of seven anencephali, Shepherd[4] in eight out of nine. The latter adds " the fact that this muscle occurs so commonly in the brainless monsters would point rather to its being a rudiment than a new muscle appearing in man." Anencephali are usually females; perhaps that fact may add strength to Albrecht's argument that woman approaches the brutes in structure more than does man!

However, as first suggested by Abraham, affirmed by Cunningham[5] and confirmed by Shepherd, it seems probable that the muscle belongs to the pectoral group, and is apparently a muscle of respiration, when functionable. Its nerve supply was found uniformly to come from the anterior thoracic by Cunningham; Shepherd found the same innervation in each of twelve muscles, two of which, however, had also an additional supply from the intercostals. Bardeleben,* who, however, completely ignores the researches of Cunningham and Shepherd, states that the nerve supply, wherever he has traced it, has been invariably from the third and fourth intercostals. The evidence, however, seems to be against Bardeleben. Based upon this innervation, Bardeleben gives the following opinion: " Die Innervirung dieser typischer Varietät, wie ich sie bezeichnen möchte, geschieht soweit Untersuchungen vorlegen, durch intercostal" and, as the rectus abdominis has the same innervation, we must consider the sternalis as a continuation of that muscle. He would call the muscle " Rectus thoracis superficialis". He believes the muscle to be vestigial. His " typscher Varietät" is that here figured.

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[1] Mem. de l'Acad. Imp. de St. Petersbourg, iii, 1860.

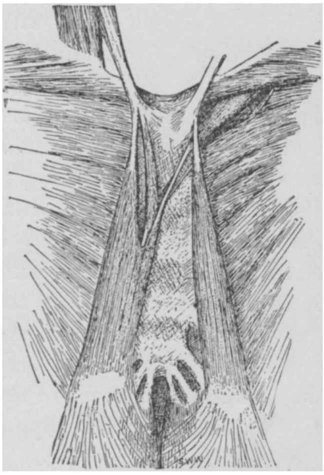
[2] Journ. Anat. and Phys. 1, 246, 1867.

[3] Trans. Acad. Med. in Ireland, i, 1883.

[4] Jour. Anat. and Phys. xix, 1885; ibid, xxiii, 1889.

[5] Journal Anat. and Phys. xviii, 1884.

The case here described would be worthy of record, if only for the extraordinary development of the muscle, on both sides, but there are other facts connected therewith that give it an additional interest. My attention was called to the muscles by two students, Messrs. C. A. Tuttle and W. P. Baldwin, in the practical anatomy room of Yale. The subject was that of a male above thirty years of age, much below the ordinary stature, and of slender, almost delicate structure throughout. On the left side the muscle was nearly an inch and a half in its greatest width, flattened, and nearly symmetrically narrowed to its tendinous " insertion." The round tendon began a little below the cartilage of the second rib, and was continuous with the outer part of the tendon of the sternomastoid, on which there were no fleshy fibres for some distance above the upper border of the manubrium. Over the cartilage of the fifth rib the muscle became rather suddenly aponeurotic and continuous with the sheath of the rectus abdominis. The glistening aponeurotic fibres diverged, fan-shaped, the larger part



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*Anatomischer Anzeiger iii, 324, 1888.

turning inwards to pass over the inner border of the rectus; others passed directly downward, while still others turned outwards and downwards over the external oblique. There were no fibres continuous with those of the abdominal muscles, and none inserted into the ribs or sternum. This arrangement of the muscle seems to be the normal one; though, in the majority of cases either origin or insertion, or both, may be materially different. The chief arterial supply was derived from a branch, of considerable size, from the internal mammary artery, which perforated the third intercostal space. I regret my inability to trace the nerve supply. Shepherd found the nerve almost constantly lying between the upper and lower divisions of the pectoral.

On the right side, the muscle was quite the same in origin and insertion, and of similar size, except for the additional portion that will now be described. The subclavian muscle of the left side was larger, and more fleshy than the normal one of the right side, and none of its fibres were inserted into the costal cartilage, the upper ones uniting with the manubrium, but the larger number passing downward and inwards, through a space left in the origin of the pectoral from the sternum, and, forming a slender, round tendon which passed obliquely to the right side of the sternum to be inserted, partly into the side of the sternum and upper border of the costal cartilage of the fourth rib, but chiefly to blend with the sternalis. As though to correct the oblique action that it otherwise would have had, there was an additional sternalis on the right side, arising from the middle fibres of the sterno-mastoid tendon to blend partly with the muscular fibres of the subclavius tendon, but also terminating in a long tendon of its own that had an insertion into the costal cartilage of the fifth rib. This accessory sternalis, in its widest part, was a half inch in width. Some fibres of the pectoralis also sent a small tendon to join that of the subclavius.

The thorax was unusually long and cylindrical, and contracted below the cartilage of the fifth rib, as though constricted by a bandage. Traction in the freshly dissected parts produced but little effect upon the sterno-mastoid, notwithstanding the fact that the sternal portion was distinct from the clavicular portion for an unusually long distance. Traction upward, however, produced a very distinct tightening of the abdominal sheath and constriction of the lower part of the thorax. The muscle here certainly was a " Spanner der Bauchaponeurose."* The recti muscles were well developed, but the pectorales poorly.

The muscle has been believed to be one of inspiration, where functionable. In this case, their large size certainly indicated function, and I cannot resist the belief that that function was not one of inspiration and that the deformity of the chest had been due to their action.

As was to be expected, there were numerous anomalies in other parts of the body. The circulation of the upper extremities showed abnormalities throughout, so much so that it was difficult to homologize the arterial branches in axilla, arm and hand. Circumstances did not permit the careful search for variations, but two striking ones may be noticed. The tendon of the digastric muscles gave off two anterior bellies, one normal in size and position, the other a flattened, triangular belly, meeting its fellow in a median raphé, and connected at its upper angle with the maxillary symphysis. Another subject, dissected at the same time, had a very similar anomaly, consisting of two fleshy bellies arising from the maxilla and passing down half way to the hyoid bone, there uniting in a short raphé, then diverging to be inserted by a tendon into the tendon of the digastric; in both subjects the genio-hyoid was normal. Another anomaly in the first-mentioned subject consisted of a double insertion, by two equal tendons, of the extensor indicis, into the index and middle finger.

An examination of this subject's lungs showed that death had resulted from phthisis. This is the fourth subject in which I have noticed numerous muscular and arterial anomalies coincident with tuberculosis, and which incline me to the belief that persons possessing such are more predisposed to this disease than those of more normal structure; or, in other words, that numerous anomalies show impaired development and lessened vitality.

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*Schultze, Anatom. Anzeiger. iii, 234, 1888.